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# Greenhouse Gas Emission Standards for Light-Duty Automobiles:

Status of Early Credit Program for  
Model Years 2009-2011

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## Status of Early Credit Program for Model Years 2009-2011

Compliance Division  
Office of Transportation and Air Quality  
U.S. Environmental Protection Agency

### NOTICE

*This technical report does not necessarily represent final EPA decisions or positions. It is intended to present technical analysis of issues using data that are currently available. The purpose in the release of such reports is to facilitate the exchange of technical information and to inform the public of technical developments.*

## Executive Summary

On May 7, 2010, the Environmental Protection Agency (EPA) published a final regulation that laid out the first-ever national greenhouse gas (GHG) emissions standards under the Clean Air Act.<sup>1</sup> The standards in this first regulation, which apply to light-duty vehicles, light-duty trucks, and medium-duty passenger vehicles, cover the 2012 through 2016 model years. Subsequently, on October 15, 2012, EPA published regulations that will require auto manufacturers to achieve additional GHG emissions reductions in the 2017 through 2025 model years.<sup>2</sup> These rules were established jointly with the National Highway Traffic Safety Administration (NHTSA), which established parallel standards for Corporate Average Fuel Economy (CAFE). Collectively the EPA GHG standards and NHTSA CAFE standards are known as the National Program.

EPA's GHG program, which will now progressively lower the average new vehicle GHG emissions in each model year from 2012 through 2025, includes a number of flexibilities designed to provide sufficient lead time for manufacturers to make technological improvements and to reduce the overall cost of the program, without compromising overall environmental objectives. One of these flexibilities is an optional program that allows manufacturers with superior greenhouse gas emission reduction performance to generate early credits in the 2009-2011 model years. The early credits program provided a valuable incentive for manufacturers that have implemented GHG-reducing technologies in excess of either the CAFE or California GHG standards prior to the 2012 model year. These early credits represent surplus reductions that were not otherwise required by law, and will allow manufacturers to more effectively transition to the increasingly stringent GHG standards. EPA's early credits program is also an important example of how the GHG and CAFE programs were aligned to achieve a coordinated National Program.<sup>3</sup>

Early credits may be earned through fleet average carbon dioxide (CO<sub>2</sub>) reductions, improvements to air conditioning systems that reduce refrigerant leakage or improve system efficiency, introduction of advanced technology vehicles (i.e., electric, fuel cell, and plug-in hybrid electric vehicles), and implementation of technologies that reduce CO<sub>2</sub> emissions over driving conditions not captured by the test procedures used for compliance with the CO<sub>2</sub> standards (i.e., "off-cycle" reductions).

Manufacturers that chose to participate in the early credits program submitted documentation in early 2012, as required under the regulations. Seventeen manufacturers chose to participate in one or more elements of the early credits program, reporting some 209 million metric tons of CO<sub>2</sub> credits over the three model years covered by the program.<sup>4</sup> Some companies qualified for the full range of types of early credits allowed, while others only reported fleet average based

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<sup>1</sup> Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, Final Rule, Federal Register 75 (7 May 2010): 25324-25728.

<sup>2</sup> 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, Final Rule, Federal Register 77 (15 October 2012): 62624-63200.

<sup>3</sup> Under the CAFE program, manufacturers that have been outperforming the CAFE standards in the same time period will be approaching the increasingly stringent CAFE standards with credits accumulated in the same model years as the early GHG credits program.

<sup>4</sup> In this report, credits are expressed in the identical units of metric tons or Megagrams (Mg). 1,000,000 grams = 1,000 kilograms = 1 Megagram = 1 metric ton.

credits or air conditioning credits. As expected, and consistent with the intent of the early credits program, sixteen manufacturers reported generating credits through fleet average reductions, which accounts for most of the early credits reported by the industry (180.2 million metric tons). Ten manufacturers reported credits resulting from improvements to the efficiency of air conditioning systems (8.1 million metric tons), and nine reported credits for air conditioning systems with low refrigerant leakage technology (20.8 million metric tons). One manufacturer provided details describing early off-cycle credits (5,632 metric tons).

This report summarizes and explains the credits reported by each manufacturer in the 2009-2011 model years, as well as explaining the options for earning and using early credits. This report is also intended to be used as a reference for users of the early credits data, which we are making available in formats appropriate for importing into spreadsheets or database applications.<sup>5</sup> EPA is neither making any assumptions regarding the potential disposition of these 209 million metric tons of early GHG credits nor attempting to speculate at this time on how manufacturers will choose to use these accumulated early credits over the applicable credit lifetimes. However, we believe that most manufacturers will be taking a long-term view by using their accumulated credits judiciously to plan a smooth pathway to the increasingly stringent GHG emission standards in the future. Table 1 shows the total early credits reported by the industry, broken down by the type of credit.

A comprehensive description of the EPA GHG program is beyond the scope of this document, thus readers should consult the regulatory announcements and associated technical documents for a detailed description of the program. See <http://www.epa.gov/otaq/climate/regs-light-duty.htm>.

**TABLE 1. TOTAL REPORTED EARLY CREDITS, BY TYPE OF CREDIT**

<b>Credit Type</b>	<b>Credits (Mg)</b>	<b>Percent of Total (%)</b>
Fleet Average	180,179,993	86.15
A/C Leakage	20,834,078	9.96
A/C Efficiency	8,136,185	3.89
Off-Cycle	5,632	0.00
<b>Total</b>	<b>209,155,888</b>	<b>100.00</b>

<sup>5</sup> This report and the data upon which it is based can be found and downloaded at <http://www.epa.gov/otaq/regs/ld-hwy/greenhouse/ld-ghg.htm>.

## **I. Introduction**

### **A. Why are we releasing this information?**

EPA is releasing this report as part of our commitment to provide the public with transparent and timely information about manufacturers' compliance with the GHG program. In the two EPA regulations that established the greenhouse gas emissions standards for light-duty vehicles, we committed to making certain information public regarding the compliance of automobile manufacturers with the program. At the same time, we committed to maintaining our practice of strongly safeguarding confidential business information, as required by regulation.<sup>6</sup>

When we issued the proposed rule for the 2012-2016 model year standards, we received considerable comment about the need for transparency regarding implementation of the program, and specifically, regarding our compliance determinations.<sup>7</sup> Many comments emphasized the importance of making greenhouse gas compliance information publicly available to ensure such transparency. In the preamble to the final regulation, we noted that our public release of data could include "...GHG performance and compliance trends information, such as annual status of credit balances or debits, use of various credit programs, attained fleet average emission levels compared with standards, and final compliance status for a model year after credit reconciliation occurs." We further noted that we would "...reassess data release needs and opportunities once the program is underway."<sup>8</sup>

As was the case with the 2012-2016 model year rule, the proposal for 2017-2025 model year GHG standards received a number of comments again stressing the need for transparency in the implementation of the GHG standards.<sup>9</sup> Our response in the final rule indicated our continued commitment to the principle of transparency and to disseminating as much information as we are reasonably, practically, and legally able to provide.<sup>10</sup> We noted that we already release a considerable amount of information regarding fuel economy, emissions, and vehicle characteristics for each vehicle model. For example, starting with the 2013 model year, the downloadable data available at [www.fueleconomy.gov](http://www.fueleconomy.gov) includes CO<sub>2</sub> emission values for each vehicle model. In addition, actual test results are released by EPA at <http://www.epa.gov/otaq/tclldata.htm>. We also stated our commitment to further expanding the information we release regarding GHG program compliance, noting in the preamble to the model year 2017-2025 final rule that "...EPA intends to publish the applicable fleet average standards (for cars and for trucks) and the actual fleet performance for each manufacturer, and the resulting credits or debits." Further, we stated that we anticipate publishing "...the amount of credits generated by each manufacturer (separately for each of the car and truck fleets) under the optional credit programs, and the associated volumes of vehicles to which those credits apply."

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<sup>6</sup> See 40 CFR Part 2, Subpart B, Confidentiality of Business Information.

<sup>7</sup> Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, Proposed Rule, Federal Register 74 (28 September 2009): 49454-49789.

<sup>8</sup> Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, Final Rule, Federal Register 75 (7 May 2010): 25469.

<sup>9</sup> 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, Proposed Rule, Federal Register 76 (1 December 2011): 74854-75420.

<sup>10</sup> 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, Final Rule, Federal Register 77 (15 October 2012): 62889.

We also suggested that we would likely publish credit transactions, as well as the overall credit or debit balance for each manufacturer after taking into account the credit and debit carry-forward provisions and any credit transactions.

Finally, we noted in the model year 2017-2025 final rule preamble that our first public release would likely be a summary of the 2009-2011 early credits reported by manufacturers. Subsequent reports will likely be more comprehensive because all manufacturers are required to submit data and compliance requirements begin to take effect. We expect that our data publication will evolve over time, as the program progresses and as we gather feedback about our reporting from stakeholders, and as our data systems and those of manufacturers make necessary adaptations to the new requirements. Manufacturers must submit final compliance reports regarding the 2012 model year in March of 2013. Later in 2013, after we complete a thorough review of the documentation and calculations received from manufacturers, we expect to publish data for the 2012 model year.

## **B. What data are we publishing?**

The EPA GHG program, which requires compliance with progressively more stringent GHG standards starting with the 2012 model year and concluding with the 2025 model year, includes certain flexibilities designed to provide sufficient lead time for manufacturers to make technological improvements and to reduce the overall cost of the program, without compromising overall environmental objectives. One of these flexibilities is an optional program that allowed manufacturers with superior greenhouse gas emission reduction performance to generate credits in the 2009-2011 model years, prior to the 2012 model year (the “early credits program”). Because this is an optional program, without any compliance implications in these early model years, only those manufacturers who achieved emissions performance beyond that required by existing California or CAFE standards chose to provide data; thus the data does not include information for all manufacturers. The first opportunity to review data from all manufacturers will be later in the 2013 calendar year, when we receive compliance reports for the 2012 model year. While there are factors that could lead to revisions to the early credits data (e.g., future credit transactions between manufacturers), the data presented in this report is believed to be stable as of the date of publication. Any changes, should they occur, will be reflected in updates to the downloadable data and in subsequent EPA reports.

This report will give a broad overview of the optional early credits program to facilitate an understanding of the early credits data that we are releasing. However, the early credits program is complex, with many regulatory nuances, and readers are encouraged to consult the regulations for detailed and specific information.<sup>11</sup>

Early credits may be earned through fleet average CO<sub>2</sub> reductions, improvements to air conditioning systems that reduce refrigerant leakage or improve system efficiency, off-cycle credits for the implementation of technologies that reduce CO<sub>2</sub> emissions over driving conditions not captured by the test procedures used to show compliance with the CO<sub>2</sub> standards, and introduction of advanced technology vehicles (i.e., electric, fuel cell, and plug-in hybrid electric

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<sup>11</sup> See 40 CFR 86.1871-12.

vehicles). The most complex aspect of the optional early credits program is the multiplicity of “pathways” that a manufacturer may select to earn credits based on their corporate fleet average tailpipe CO<sub>2</sub> emissions performance. The program has four pathways that provide opportunities for early credit generation through over-compliance with a fleet average CO<sub>2</sub> level specified by EPA in the regulations. Since EPA’s GHG standards do not begin until model year 2012, EPA established fleet average thresholds below which manufacturers could generate early fleet average credits. Manufacturers wishing to earn early credits must select one of these four pathways, and the selected pathway must be followed for the three model years of 2009-2011. For two of the pathways, the emission levels below which credits are available are equivalent to the GHG standards established by California prior to the adoption of the EPA GHG program. Two additional pathways include credits based on over-compliance with CO<sub>2</sub> levels equivalent to the CAFE standards in states that did not adopt the California GHG standards. These four pathways are described in more detail in section II.<sup>12</sup>

### **C. How many early credits were reported?**

Table 2 summarizes the credits (or deficits) reported by manufacturers in each of the three model years for each participating manufacturer. Credits are expressed in units of metric tons, or Megagrams (Mg). The early credits program requires that participating manufacturers determine fleet average credits for each of the three model years under their selected pathway, and that they may carry forward their net credits from the three early years to apply to compliance with EPA’s GHG standards. Thus, even manufacturers with a deficit in one or more of the early model years, (i.e., their fleet average performance was worse than the applicable emissions threshold under the selected pathway) could benefit from the early credits program if their net credits over the three years is a positive value. Manufacturers not listed in Table 1 have thus far elected not to participate in the early credits program. Due to the ongoing investigation of the emissions and fuel economy testing methods of Hyundai and Kia, the outcome of which could impact the credits accrued by these companies, credit values for Hyundai and Kia are not being reported. They will appear in future reports after the conclusion of the investigation.

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<sup>12</sup> The California GHG standards and CAFE MPG standards included provisions for model years 2009-2011 allowing credits to be carried forward to later model years. By adopting early credit provisions under the GHG program, EPA maintained some level of consistency with these pre-existing programs.

**TABLE 2. EARLY GHG CREDITS REPORTED BY MODEL YEAR AND MANUFACTURER (MG)**

Manufacturer	Model Year			Total
	2009	2010	2011	
BMW	409,854	280,450	194,599	884,903
Chrysler	5,583,013	4,337,613	(2,129,654)	7,790,972
Daimler	96,467	124,120	157,685	378,272
Ford	8,252,113	7,093,702	(49,379)	15,296,436
GM	13,009,374	11,073,134	493,068	24,575,576
Honda	14,073,890	14,070,290	7,370,928	35,515,108
Mazda	1,405,721	3,201,708	875,213	5,482,642
Mitsubishi	625,166	521,776	302,394	1,449,336
Nissan	10,496,712	5,781,739	1,852,749	18,131,200
Subaru	1,620,769	2,225,296	1,909,106	5,755,171
Suzuki	448,408	329,382	98,860	876,650
Tesla		35,580	14,192	49,772
Toyota	31,325,738	34,457,797	20,322,300	86,105,835
Volkswagen	2,243,205	2,811,663	1,386,537	6,441,405
Volvo	119,583	237,398	65,629	422,610
<b>Industry Total</b>	<b>89,710,013</b>	<b>86,581,648</b>	<b>32,864,227</b>	<b>209,155,888</b>

**D. How can these credits be used?**

The ability to earn and bank credits, including early credits, is a fundamental aspect of the program design intended to assist manufacturers in meeting the 2012-2016 model year standards, as well as to aid in the transition to the progressively more stringent standards in the 2017-2025 model years. In establishing the early credits program, EPA wanted to maintain consistency with the ability to generate and carry forward credits under both the CAFE standards and the California standards for the 2009-2011 model years. These credits represent surplus emission reductions that manufacturers achieved in addition to those required by law under either the California or CAFE standards. The early credits program gives manufacturers additional flexibility to transition into the 2012 and later GHG standards with a bank of credits available. Credit banking, as well as emissions averaging and credit trading (collectively termed Averaging, Banking, and Trading, or “ABT”) have been an important part of many mobile source programs under the Clean Air Act. These programs help manufacturers in planning and implementing the orderly phase-in of emissions control technology in their production, consistent with their typical redesign schedules. These provisions are an integral part of the standard-setting itself, and not just an add-on to help reduce costs. In many cases, ABT programs address issues of cost or technical feasibility which might otherwise arise, allowing EPA to set a standard that is more stringent than could be achieved without the flexibility provided by ABT programs. We believe that the net effect of the ABT provisions, including the early credits,



allows additional flexibility, encourages earlier penetration of emission reduction technologies than might otherwise occur, and does so without reducing the overall effectiveness of the program.

Credits (or deficits) are calculated separately for cars and trucks. If a manufacturer has a net deficit in either the car or truck category, existing credits must be applied towards that deficit. Although a deficit may be carried forward up to three years, under no circumstances is a manufacturer allowed to carry forward a deficit if they have credits available with which to offset the deficit. If credits remain after addressing any deficits, those credits may be “banked” for use in a future year, or sold or otherwise transferred to another manufacturer. Credits earned in the 2010 through 2016 model years may be carried forward and used through the 2021 model year. Credits from the 2009 model year and 2017 and later model years may only be carried forward for five years. Thus, any early credits from the 2009 model year that remain after the 2014 model year will expire. In addition, credits from the 2009 model year may only be used within a manufacturer’s fleet, and may not be traded to another manufacturer. These restrictions for the 2009 model year were established based on concerns that such credits might provide a “windfall” since the California light truck standards are less stringent than the comparable CAFE standards in effect for that model year.

At this point it is difficult to make any assumptions regarding the disposition of these 209 million tons of reported early GHG credits. One could create any number of hypothetical scenarios that show these credits being used in a variety of ways (e.g., across the industry, within a single company, across all model years of the program, within a single model year, within or between car and truck fleets, etc.). EPA is not attempting to speculate at this time on how manufacturers will choose to use these reported credits over the applicable credit lifetimes. However, we continue to believe that most manufacturers will be taking a long-term view of the increasingly stringent standards in the future and will use their accumulated credits judiciously to plan a smooth pathway to the low emissions required through the 2025 model year. We do not expect manufacturers to use these credits injudiciously, e.g., to make short-term adjustments to shift their fleet to less efficient vehicles or to broadly delay the introduction of technologies, as doing so could jeopardize long-term compliance and increase the risk of facing future enforcement actions. We plan to make data on the use of credits, including credit trades among manufacturers, available in future credit reports.

However, one easy translation to make is to determine what a given exceedance of an emission standard “costs” in terms of tons of credits. The calculation of fleet average credits (described in more detail in the next section) is the same for cars and trucks with the exception that the expected lifetime mileage (vehicle miles traveled, or VMT) differs between cars and trucks. Because trucks are assumed to have a greater lifetime VMT (225,865 miles) than cars (195,264 miles), a given gram per mile of “non-compliance” in a truck fleet will require more credits (in tons) to offset. Given these VMT differences, one car that is one gram per mile above the standard will cost 0.195 metric tons of credits to offset, and similarly, for a single truck that is one gram non-compliant the cost is 0.226 metric tons. For rough calculations, however, it makes sense to assume that for cars and trucks, one gram per mile costs about 0.2 metric tons to offset (or 5 grams per mile non-compliance costs about 1 metric ton). For example, a manufacturer with a fleet average that is 5 grams/mile above its fleet average standard and that produced 1

million vehicles in that model year will need about one million metric tons of credit to offset the deficit created by the noncompliant fleet.

## II. Credits Based on Early Fleet Average CO<sub>2</sub> Reductions

Fleet average GHG credits are based on the difference between the applicable emission standard and the actual fleet performance (in grams per mile), the expected lifetime miles (vehicle miles traveled, or VMT) of a vehicle, and the total vehicle production volume. The VMT used in this calculation for passenger cars is 195,264 miles, and for trucks is 225,865 miles. The equation that generates the metric tons (or Megagrams, Mg) of credits for a given fleet is as follows:

$$\text{Credits (metric tons)} = \frac{(\text{Standard} - \text{Fleet Average}) \times \text{VMT} \times \text{Production Volume}}{1,000,000}$$

As described earlier, there are four distinct pathways that manufacturers may select from to earn early fleet average credits, two of which base credits on the effective California standards, and the remaining two which include credits based on compliance with the CAFE standards in states that have not adopted the California standards. Table 3 summarizes the credits reported by manufacturers under each of the four available pathways. Because these pathways imply slightly different data and information reporting, we are summarizing the fleet average credits separately according to the selected pathway. Readers should refer to the Appendix and to the downloadable data for the complete detailed values underlying the fleet average credits, such as the applicable emission credit threshold levels and the manufacturer's reported fleet average performance. Manufacturers reported a total of 180,179,993 metric tons of CO<sub>2</sub>, or 86% of all the early reported credits, based on fleet average CO<sub>2</sub> emission reductions (see Table 1). Because these manufacturers were known to be outperforming either the California or CAFE standards in the 2009-2011 model years, EPA anticipated that these manufacturers would generate early credits, and, in some cases, substantial numbers of credits. Although the fleet targets under each pathway differ slightly, note that they increase in stringency rapidly. See, for example, Table 4, which shows a reduction in the fleet targets of 56 grams/mile for cars and 49 grams/mile for trucks from 2009 to 2011. Most manufacturers exhibit a substantial drop in credit accumulation from 2009 to 2011 (in some cases transitioning to generating a deficit rather than credits), indicating that the technological progress of these manufacturers, over these model years, was being outpaced by the stringency of the emission targets. We expect that this trend will continue for several model years, and that these companies will use the early credits as they bring new technologies on line to meet the tight emission standards of future model years. For those companies with the greatest number of credits, the concerns regarding the potential for "windfall" credits from the 2009 model year are mitigated by the fact that those credits will likely expire before those companies can make use of them (and no other company may benefit, because those credits may not be traded).

**TABLE 3. REPORTED EARLY FLEET AVERAGE CREDITS, BY EARLY CREDIT PATHWAY**

<b>Pathway</b>	<b>Credits (Mg)</b>	<b>Percent of Total (%)</b>
1	134,258,207	74.51
2	0	0.00
3	45,547,983	25.28
4	373,803	0.21
<b>Total</b>	<b>180,179,993</b>	<b>100.00</b>

**A. Credits Reported By Manufacturers Using Pathway 1**

Pathway 1 requires that credits be measured over the manufacturer’s nationwide fleet, with credits based on fleet performance relative to the California standards in effect at the time. The California standards effective in the 2009-2011 model years are not based on footprint, but are “flat” universal standards that all manufacturers were required to meet. Also note that under this pathway the vehicle categories subject to the thresholds in Table 4 are those defined in the California regulations. These categories are subtly different from those used in the EPA GHG program in the 2012 and later model years; readers should refer to the California and EPA GHG program regulations for the precise definitions.<sup>13</sup>

The ten manufacturers selecting Pathway 1 reported generating credits against the California-equivalent emission standards shown in Table 4.

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<sup>13</sup> For EPA definitions, see the Code of Federal Regulations, 40 CFR 86.1803-01. For California definitions, see the California Code of Regulations, 13 CCR 1900.

**TABLE 4. CALIFORNIA EQUIVALENT EMISSION STANDARDS BY MODEL YEAR AND VEHICLE CATEGORY (GRAMS/MILE)**

<b>Model year</b>	<b>Passenger cars and light trucks with LVW<sup>1</sup> of 0–3,750 lbs</b>	<b>Light trucks with LVW<sup>1</sup> &gt;3,750 lbs and a GVWR<sup>2</sup> up to 8,500 lbs, and MDPVs<sup>3</sup></b>
2009	323	439
2010	301	420
2011	267	390

<sup>1</sup> LVW is “loaded vehicle weight,” defined by regulation as the measured curb weight of the vehicle plus 300 lbs.

<sup>2</sup> GVWR is “gross vehicle weight rating,” which is the maximum load capacity specified by the manufacturer.

<sup>3</sup> MDPV is “medium-duty passenger vehicle,” a category that covers passenger vehicles from 8,500-10,000 lbs GVWR (i.e., sport utility vehicles and vans).

Table 5 shows the early fleet average credits reported by manufacturers using Pathway 1. As can be seen, all of these manufacturers reported net credits over the three model years (this is by definition; if they could not earn net credits under this pathway they would either select a different pathway or not participate in the early credits program), despite some reporting a deficit in some model years and vehicle categories. Note that because of concerns expressed by some stakeholders during the regulatory process that there may be a potential for a large number of credits under Pathway 1 in the 2009 model year, the regulations included two restrictions. First, 2009 model year credits earned under this pathway may not be sold to another manufacturer, and second, these credits may be carried forward only five years, to the 2014 model year, after which they expire. As noted earlier, credits from 2010 and 2011 may be carried forward to the 2021 model year.

**TABLE 5. EARLY FLEET AVERAGE CREDITS REPORTED BY MANUFACTURERS USING PATHWAY 1**

		Model Year					
		2009		2010		2011	
Manufacturer	Fleet	Production Volume	Credits (Mg)	Production Volume	Credits (Mg)	Production Volume	Credits (Mg)
Chrysler	Car	287,364	224,447	430,110	(1,259,775)	335,790	(2,753,843)
	Truck	528,286	4,414,889	729,662	4,284,933	739,487	(1,002,145)
Ford	Car	508,727	2,384,066	856,065	2,005,904	792,654	(2,476,429)
	Truck	504,921	4,789,847	965,968	3,054,497	873,635	591,971
GM	Car	1,048,593	5,733,069	857,825	502,507	1,006,900	(5,701,728)
	Truck	844,892	4,961,620	932,358	8,002,308	1,419,043	2,564,097
Nissan	Car	605,439	6,502,124	617,548	4,220,471	666,660	781,048
	Truck	234,883	3,554,474	236,588	1,122,176	299,074	540,403
Subaru	Car	156,871	459,469	183,763	71,765	176,923	(967,307)
	Truck	43,945	1,161,300	74,489	2,153,531	129,950	2,876,413
Suzuki	Car	24,859	232,995	20,212	165,760	19,390	18,931
	Truck	10,146	215,413	8,728	163,622	7,864	79,929
Tesla	Car			599	35,206	269	14,024
Toyota	Car	1,273,815	19,400,957	1,412,172	20,129,484	1,140,255	5,343,618
	Truck	482,202	10,237,780	793,226	12,003,853	834,019	12,997,923
Volvo	Car	31,618	37,043	23,529	(73,510)	24,846	(160,100)
	Truck	11,420	82,540	34,413	310,908	27,761	225,729
<b>Total</b>		<b>6,597,981</b>	<b>64,392,033</b>	<b>8,177,255</b>	<b>56,893,640</b>	<b>8,494,520</b>	<b>12,972,534</b>

## B. Credits Reported By Manufacturers Using Pathway 2

Pathway 2 is identical to Pathway 1 with the exception that the credits are calculated not for a nationwide fleet, but for the manufacturer’s fleet only in California and the states that have adopted the California standards under Section 177 of the Clean Air Act (these states are referred to as the “Section 177 states”).<sup>14</sup> Pathway 2 was not used by any manufacturer, presumably because manufacturers that were able to meet the California standards in California and the Section 177 states found that they could also earn credits in the remainder of the states. In other words, no manufacturer found an advantage to excluding the states outside California and the Section 177 states from their credit calculations.

<sup>14</sup> As of the date the regulation was finalized, there were thirteen states that had adopted the California greenhouse gas emission standards: Arizona, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, and Washington, DC.

### C. Credits Reported By Manufacturers Using Pathway 3

Pathway 3 allows manufacturers to earn credits as under Pathway 2 (the California standards applied to the fleet of vehicles in California and the Section 177 states), plus additional credits that may be earned in the remaining states against threshold levels that are based on a translation of the CAFE MPG standards to GHG grams per mile threshold levels. The emission threshold levels used for generating credits in the states outside California and the Section 177 states under Pathway 3 are shown in Table 6 below.

**TABLE 6. CAFE-EQUIVALENT EMISSION STANDARDS BY MODEL YEAR AND VEHICLE CATEGORY (GRAMS/MILE)**

<b>Model year</b>	<b>Passenger Automobiles</b>	<b>Light Trucks</b>
2009	323	381*
2010	323	376*
2011	Footprint-based standard	Footprint-based standard

\*Manufacturers that optionally used a footprint-based standard must use that standard.

These threshold levels are based on the CAFE standards that were in effect in the 2009-2011 model years. In the 2009 and 2010 model years manufacturers could optionally calculate a manufacturer-specific CAFE standard for their light truck fleet, and starting in the 2011 model year, footprint-based CAFE standards became mandatory both for cars and trucks. Thus, for the purposes of generating early light truck credits, manufacturers using the footprint-based option in the 2009 and 2010 model years must determine a manufacturer-specific, footprint-based CO<sub>2</sub> threshold level to use in lieu of the numerical values shown in the table above. In the 2011 model year the early credits must be generated using a footprint-based CO<sub>2</sub> threshold level. The specific emission levels actually used and reported by each manufacturer are included in the detailed table in the Appendix and in the downloadable data. Credits are generated under this pathway using the car and truck definitions that apply to the CAFE program that are in place for the model year in which credits are being generated. This adds an additional layer of complexity for two reasons: (1) these definitions were revised by NHTSA such that they change starting in the 2011 model year, and (2) medium-duty passenger vehicles (MDPVs) are not part of the CAFE program until the 2011 model year, and therefore are not part of the early credits calculations for 2009 and 2010 under Pathway 3.

Table 7 shows the credits reported by the five manufacturers that used Pathway 3. The credits are shown for each vehicle category within each of the separate regions required under this pathway. The credits reported in the 2009 model year are subject to the same restrictions as under Pathway 1, i.e., they may not be sold and they have a limited life relative to the 2010 and 2011 credits.

**TABLE 7. EARLY FLEET AVERAGE CREDITS REPORTED BY MANUFACTURERS USING PATHWAY 3**

Manufacturer	Region	Fleet	Model Year					
			2009		2010		2011	
			Production Volume	Credits (Mg)	Production Volume	Credits (Mg)	Production Volume	Credits (Mg)
Honda	NC	Car	433,183	5,582,613	414,562	5,828,330	317,065	2,290,721
		Truck	232,149	2,202,242	290,216	3,080,833	280,042	569,265
	CA/177	Car	388,318	4,321,998	429,692	3,272,232	247,437	821,364
		Truck	89,079	1,327,909	95,106	1,159,980	244,121	3,032,611
Mazda	NC	Car	61,283	514,554	133,292	1,561,628	112,883	506,966
		Truck	35,084	412,061	64,558	685,325	18,435	(49,966)
	CA/177	Car	40,884	335,293	86,948	611,201	59,856	128,565
		Truck	10,612	143,813	25,351	343,554	25,145	289,648
Mitsubishi	NC	Car	60,347	341,724	30,144	270,758	49,447	212,415
		Truck	8,573	114,244	14,832	177,552	15,159	34,239
	CA/177	Car	23,293	150,093	15,733	39,937	25,408	0
		Truck	872	19,105	2,699	33,529	7,712	55,740
Volkswagen	NC	Car	139,498	898,885	143,295	1,371,037	151,373	650,269
		Truck	21,078	85,694	23,488	106,102	35,176	79,450
	CA/177	Car	118,411	693,642	134,231	629,052	121,114	(141,895)
		Truck	13,295	171,164	19,350	257,859	25,667	324,648
<b>Grand Total</b>			<b>1,675,959</b>	<b>17,315,034</b>	<b>1,923,497</b>	<b>19,428,909</b>	<b>1,736,040</b>	<b>8,804,040</b>

Notes: CA/177 = The region comprised of California and the Section 177 states. NC = The region comprised of the states outside California and the Section 177 states.

#### D. Credits Reported By Manufacturers Using Pathway 4

Pathway 4, which was used by only one manufacturer, is for manufacturers choosing to forego California-based credits entirely and earn only CAFE-based credits outside California and the Section 177 states. Credits are earned under this pathway against the thresholds described in Table 6 and the previous section. Table 8 shows the early credits reported by BMW, the sole manufacturer that chose to use Pathway 4.

**TABLE 8. EARLY FLEET AVERAGE CREDITS REPORTED BY MANUFACTURERS USING PATHWAY 4**

		Model Year					
		2009		2010		2011	
Manufacturer	Fleet	Production Volume	Credits (Mg)	Production Volume	Credits (Mg)	Production Volume	Credits (Mg)
BMW	Car	95,270	316,248	72,225	197,441	153,966	(30,064)
	Truck	16,978	(49,852)	13,612	(24,596)	31,323	(35,374)
<b>Total</b>		<b>112,248</b>	<b>266,396</b>	<b>85,837</b>	<b>172,845</b>	<b>185,289</b>	<b>(65,438)</b>

### III. Credits Based on Improvements to Air Conditioning Systems

Over 95% of the new cars and light trucks in the United States are equipped with air conditioning (A/C) systems. There are two mechanisms by which A/C systems contribute to the emissions of greenhouse gases: through leakage of hydrofluorocarbon refrigerants into the atmosphere (sometimes called “direct emissions”) and through the consumption of fuel to provide mechanical power to the A/C system (sometimes called “indirect emissions”). The high global warming potential of the current automotive refrigerant means that leakage of a small amount of refrigerant will have a far greater global warming impact than emissions of a similar amount of CO<sub>2</sub>. Refrigerant leakage can be reduced significantly by systems that incorporate leak-tight components, or, ultimately, by using a refrigerant with a lower global warming potential. The A/C system also contributes to increased tailpipe CO<sub>2</sub> emissions through the additional work required to operate the compressor, fans, and blowers. This additional power demand is ultimately met by using additional fuel, which is converted into CO<sub>2</sub> by the engine during combustion and exhausted through the tailpipe. These emissions can be reduced by increasing the overall efficiency of an A/C system, thus reducing the additional load on the engine from A/C operation, which in turn means a reduction in fuel consumption and a commensurate reduction in GHG emissions.

Manufacturers may generate and use credits for improved A/C systems in complying with the CO<sub>2</sub> fleet average standards taking effect in the 2012 model year (or otherwise to be able to bank or trade the credits). These provisions may be used in the 2009-2011 model years to generate early credits, prior to the 2012 model year. We expect that most manufacturers will choose to use the A/C credit provisions as part of their compliance demonstration. Ten manufacturers were able to claim credits for A/C systems that either reduce refrigerant leakage or reduce GHG exhaust emissions. Although the quantity of A/C credits is small relative to the fleet average credits reported by manufacturers, EPA is encouraged by the use of these credit provisions and takes it as an indication that manufacturers are exploring a full range of options for reducing GHG emissions. The A/C provisions are structured as credits, unlike the CO<sub>2</sub> standards for which manufacturers will demonstrate compliance using the EPA test procedures. Those tests do not measure either A/C refrigerant leakage or the increase in tailpipe CO<sub>2</sub> emissions attributable to the additional engine load of A/C systems. Because it is optional to include A/C-related GHG emission reductions as an input to a manufacturer’s compliance demonstration, the A/C provisions are viewed as an additional program that credits manufacturers for implementing A/C



technologies that result in real-world reductions in GHG emissions. A summary of the air conditioning credits reported by the industry is shown in Table 9.

**TABLE 9. REPORTED EARLY AIR CONDITIONING CREDITS, BY TYPE AND MODEL YEAR (MG)**

<b>Type</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Grand Total</b>
A/C Efficiency	2,036,470	2,695,786	3,403,929	<b>8,136,185</b>
A/C Leakage	5,696,751	7,389,503	7,747,824	<b>20,834,078</b>
<b>Total</b>	<b>7,733,221</b>	<b>10,085,289</b>	<b>11,151,753</b>	<b>28,970,263</b>

**A. Reported Credits From Reduced A/C Refrigerant Leakage**

A manufacturer choosing to generate A/C leakage credits with a specific A/C system is required to calculate a leakage “score” for the A/C system. This score is based on the number, quality, and technology of the components, fittings, seals, and hoses of the A/C system. This score, which is determined in grams per year, is calculated using the procedures specified by the Society of Automotive Engineers Surface Vehicle Standard J2727. It is subsequently converted to a grams/mile credit value for consistency with the units of GHG exhaust emissions. The grams/mile value is used to calculate the total tons of credits attributable to an A/C system by accounting for the global warming potential (GWP) of the refrigerant, the VMT of the vehicle class (car or truck), and the production volume of the A/C system. Note that while A/C leakage credits can also be based on transitioning to systems that use refrigerants with a lower GWP, the use of the conventional hydrofluorocarbon refrigerant (HFC-R134a) was universal in the model years covered by these early credits. Thus, these credits are based entirely on improvements to the physical systems that contain and move the refrigerant through the A/C system.

Nine manufacturers participated in the early A/C credits program based on reducing refrigerant leakage, as shown in Table 10. These manufacturers reported a total of 20,834,078 metric tons of CO<sub>2</sub> credits over the three model years, or about 10% of the total early credits reported by the industry (see Tables 1 and 9).

**TABLE 10. EARLY CREDITS REPORTED EARNED FROM LOW-LEAK AIR CONDITIONING SYSTEMS**

Manufacturer	Fleet	Model Year					
		2009		2010		2011	
		Production Volume	Credits (Mg)	Production Volume	Credits (Mg)	Production Volume	Credits (Mg)
BMW	Car	95,270	47,490	72,225	34,939	153,966	80,174
	Truck	16,978	17,334	13,612	13,670	31,323	35,952
Chrysler	Car	287,364	237,143	430,110	352,786	335,790	340,299
	Truck	528,286	551,632	729,662	740,466	739,487	843,506
Daimler	Car	57,812	31,408	59,736	30,856	71,711	41,110
	Truck	20,035	18,297	33,642	32,334	33,670	16,851
Ford	Car	421,306	247,818	713,574	387,819	832,559	476,473
	Truck	553,174	830,382	1,085,059	1,623,677	833,730	1,279,698
GM	Car	954,239	792,488	786,528	716,959	658,994	1,340,422
	Truck	729,189	1,393,043	644,464	1,487,242	1,089,891	1,648,173
Honda	Car	802,442	246,771	836,304	277,048	563,002	142,831
	Truck	321,228	176,484	385,322	226,311	524,163	283,673
Nissan	Car	143,263	20,466	167,243	16,755	248,209	44,656
	Truck	220,896	100,005	214,294	109,905	251,623	135,259
Toyota	Car	1,264,617	507,913	1,402,166	583,900	1,090,293	532,137
	Truck	363,547	343,961	648,233	598,764	814,743	343,787
Volkswagen	Car	266,152	110,126	284,037	120,055	268,550	109,887
	Truck	26,130	23,990	36,327	36,017	64,780	52,936
<b>Grand Total</b>		<b>7,071,928</b>	<b>5,696,751</b>	<b>8,542,538</b>	<b>7,389,503</b>	<b>8,606,484</b>	<b>7,747,824</b>

**B. Reported Credits From Improved A/C System Efficiency**

Manufacturers that make improvements in their air conditioning systems to increase efficiency, and thus reduce CO<sub>2</sub> emissions due to air conditioning system operation, may be eligible for air conditioning efficiency credits. Most of the additional load on the engine from air conditioning systems comes from the compressor, which pumps the refrigerant around the system loop. A significant additional load on the engine may also come from electric or hydraulic fans, which are used to move air across the condenser, and from the electric blower, which is used to move air across the evaporator and into the cabin. Manufacturers have several currently-existing technology options for improving efficiency, including more efficient compressors, fans, and motors, and system controls that avoid over-chilling the air (and subsequently re-heating it to provide the desired air temperature with an associated loss of efficiency). For vehicles equipped with automatic climate-control systems, real-time adjustment of several aspects of the overall system (such as engaging the full capacity of the cooling system only when it is needed, and

maximizing the use of recirculated air) can result in improved efficiency. The regulations provide manufacturers with a “menu” of technologies and associated credit values (in grams/mile of CO<sub>2</sub>). The total tons of credits are then based on the total volume of vehicles in a model year using these technologies.

Ten manufacturers used the provisions that allow early credits based on improvements to the overall efficiency of the A/C system, as shown in Table 11. These manufacturers reported a total of 8,136,185 metric tons of CO<sub>2</sub> credits over the three model years, or almost 4% of the total early credits reported by the industry (see Tables 1 and 9).

**TABLE 11. EARLY CREDITS REPORTED EARNED BY IMPROVING THE EFFICIENCY OF AIR CONDITIONING SYSTEMS**

Manufacturer	Fleet	Model Year					
		2009		2010		2011	
		Production Volume	Credits (Mg)	Production Volume	Credits (Mg)	Production Volume	Credits (Mg)
BMW	Car	95,270	62,528	72,225	46,231	153,966	113,483
	Truck	16,978	16,106	13,612	12,765	31,323	30,428
Chrysler	Car	171,522	68,074	258,478	107,553	335,790	118,345
	Truck	435,791	86,828	579,480	111,650	739,487	324,184
Daimler	Car	53,062	30,018	62,638	35,122	69,772	71,586
	Truck	20,035	16,744	33,642	25,808	33,670	28,138
Ford	Car	0	0	34,076	15,304	57,499	14,415
	Truck	0	0	12,516	6,501	464,707	64,493
GM	Car	838,289	113,142	597,220	99,629	542,683	310,606
	Truck	87,771	12,683	620,030	263,524	1,043,792	330,160
Honda	Car	466,518	161,988	481,676	177,222	331,756	119,152
	Truck	140,335	53,885	125,879	48,334	342,934	111,311
Nissan	Car	605,439	225,310	617,548	231,360	666,660	248,584
	Truck	234,883	94,333	236,588	81,072	299,074	102,799
Tesla	Car	0	0	599	374	269	168
Toyota	Car	1,273,815	639,927	1,412,172	768,652	1,140,255	621,412
	Truck	482,160	195,200	793,187	373,144	834,019	483,423
Volkswagen	Car	266,152	231,296	284,037	249,431	268,550	239,277
	Truck	26,130	28,408	36,327	42,110	64,780	71,965
<b>Grand Total</b>		<b>5,214,150</b>	<b>2,036,470</b>	<b>6,271,930</b>	<b>2,695,786</b>	<b>7,420,986</b>	<b>3,403,929</b>

#### IV. Credits Based on Off-Cycle Emission Reductions

General Motors requested, and was subsequently granted, off-cycle credits for a technology used on certain gasoline-electric hybrid vehicles. The off-cycle credits reported by General Motors are shown in Table 12. The technology is an auxiliary electric pump which keeps engine coolant circulating in cold weather while the vehicle is stopped and the engine is off. These hybrid vehicles feature engine stop/start capability for improved fuel economy, and as a result the engine can frequently be turned off when the vehicle is stopped, such as at a traffic light. However, during cold weather, a hybrid vehicle without the auxiliary heater pump would need to keep the engine idling during the stop periods solely to maintain coolant flow to the heater to maintain a comfortable temperature inside the vehicle. This would reduce the fuel economy benefits of the stop/start feature during cold weather, which is an “off-cycle” temperature condition not captured by the greenhouse gas test methods. Note that starting with the 2014 model year, the regulations provide a “menu” of off-cycle technologies and associated credits for each technology. Manufacturers implementing engine idle stop/start technologies may receive off-cycle credits for those technologies, and the addition of an auxiliary heat pump (or system that achieves the same result) to these vehicles will gain additional off-cycle credits. Manufacturers may also seek additional off-cycle credits for technologies not listed on the menu based on data and analyses submitted to EPA for approval.

**TABLE 12. EARLY CREDITS REPORTED EARNED BY OFF-CYCLE EMISSION REDUCTIONS**

Manufacturer	Fleet	2009		2010		2011	
		Production Volume	Credits (Mg)	Production Volume	Credits (Mg)	Production Volume	Credits (Mg)
GM	Truck	8,671	3,329	2,512	965	3,484	1,338
<b>Grand Total</b>		<b>8,671</b>	<b>3,329</b>	<b>2,512</b>	<b>965</b>	<b>3,484</b>	<b>1,338</b>

#### V. Early Advanced Technology Vehicle Incentives

The GHG regulations include provisions that provide a temporary regulatory incentive for the commercialization of certain advanced vehicle power trains — electric vehicles (EVs), plug-in hybrid electric vehicles (PHEVs), and fuel cell vehicles (FCVs). The purpose of these provisions is to provide a temporary incentive to promote technologies which have the potential to produce very large GHG reductions in the future, but which face major challenges, such as vehicle cost, consumer acceptance, and the development of low-GHG fuel production infrastructure. These incentives may also be used by manufacturers that introduce these advanced technologies in the 2009-2011 model years.

There are two ways manufacturers can treat advanced technology vehicles that are introduced in the 2009-2011 model years. First, until specific production volume thresholds are reached, the GHG emissions of EVs and FCVs will be considered for compliance purposes to be zero, as will the GHG emissions of PHEVs for the portion of operation that uses electricity from the grid. After those production thresholds are met, these vehicles will be required to account for their net

“upstream” emissions relative to a conventional gasoline vehicle.<sup>15</sup> We acknowledge, based on current electricity and hydrogen production processes, that EVs, PHEVs, and FCVs yield higher upstream GHG emissions than comparable gasoline vehicles. But we support temporarily rewarding advanced emissions control technologies by foregoing modest emissions reductions in the short term in order to lay the foundation for the potential for much larger emission reductions in the longer term. EVs, PHEVs, and FCVs are potential GHG “game changers” if major cost and consumer barriers can be overcome and if there is a nationwide transformation to low- GHG electricity (or hydrogen, in the case of FCVs). Second, manufacturers have the option of not including these vehicles in their calculation of fleet average credits in the 2009-2011 model years, but instead “deferring” the use of these vehicles and their associated compliance values to the 2012 or later model years. Manufacturers using this option must maintain records of the volume of these vehicles and their GHG emission levels and ensure that these vehicles are not included in their fleet average credit calculations using one of the four fleet average credit pathways.

Two manufacturers chose the “deferral” option, electing to not include some 2011 model year advanced technology vehicles in their 2009-2011 fleet average credits. Other manufacturers with advanced technology vehicles chose to include those vehicles in their fleet average credits. Because there is no emission standard that applies to these vehicles until these manufacturers elect to “use” these vehicles in compliance calculations for a future model year, there are no associated tons of credits to report at this time. Thus we are only able to report the volume of these vehicles and the emission values (as reported to us by these two manufacturers) that manufacturers have elected to defer to a future model year in the calculation of a future model year fleet average.

**TABLE 13. MODEL YEAR 2011 ADVANCED TECHNOLOGY VEHICLES REPORTED AS DEFERRED TO A FUTURE MODEL YEAR**

<b>Manufacturer</b>	<b>Fleet</b>	<b>Production</b>	
		<b>Volume</b>	<b>GHG (g/mi)</b>
Daimler	Car	623	0
GM	Car	4,370	54
<b>Grand Total</b>		<b>4,993</b>	

## **VI. Conclusion**

EPA’s GHG program includes a number of flexibilities designed to provide sufficient lead time for manufacturers and to reduce the overall cost of the program, without compromising overall

<sup>15</sup> In this case, “upstream” refers to the emissions associated with the production and distribution of electricity and hydrogen.

environmental objectives. One of these flexibilities is an optional program that allows manufacturers with superior greenhouse gas emission reduction performance to generate early credits in the 2009-2011 model years. The early credits program provided a valuable incentive for manufacturers that have implemented GHG reducing technologies in excess of either the CAFE or California GHG standards prior to MY 2012. These early credits represent surplus reductions that were not otherwise required by law, and will allow manufacturers to transition to the increasingly stringent GHG standards. EPA's early credits program is also an important example of how the GHG and CAFE programs were aligned to achieve a coordinated National Program.<sup>16</sup>

EPA is providing this report as part of our commitment to provide the public with timely, transparent information about the implementation of the light-duty GHG standards program. This report summarizes the credits reported by each manufacturer in the 2009-2011 model years and explains the options for earning and using early credits. Manufacturers that chose to participate in the early credits program submitted documentation in early 2012, as required under the regulations. Seventeen manufacturers chose to take advantage of one or more elements of the early credits program, reporting some 209 million metric tons of CO<sub>2</sub> credits over the three model years covered by the program.

This report is also intended to be used as a reference for users of the early credits data, which we are making available in formats appropriate for importing into spreadsheets or database applications. EPA is neither making any assumptions regarding the potential disposition of these early GHG credits nor attempting to speculate at this time on how manufacturers will choose to use these accumulated early credits over the applicable credit lifetimes. However, we believe that most manufacturers will be taking a long-term view by using their accumulated credits judiciously to plan a smooth pathway to the increasingly stringent GHG emission standards in the future.

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<sup>16</sup> Under the CAFE program, manufacturers that have been outperforming the CAFE standards in the same time period will be approaching the increasingly stringent CAFE standards with a bank of credits accumulated in the same model years as the early GHG credits program.

**APPENDIX I – REPORTED CREDITS BASED ON EARLY FLEET AVERAGE CO<sub>2</sub> REDUCTIONS**

Manufacturer	Pathway	Model Year	Region	Fleet	Fleet Threshold (g/mi)	Fleet Average (g/mi)	Vehicle Production (# units)	Fleet Average Credits (Mg)
BMW	4	2009	NC	Car	323	306	95,270	316,248
				Truck	381	394	16,978	(49,852)
		2010	NC	Car	323	309	72,225	197,441
				Truck	376	384	13,612	(24,596)
		2011	NC	Car	302	303	153,966	(30,064)
				Truck	351	356	31,323	(35,374)
<b>BMW Total</b>							<b>383,374</b>	<b>373,803</b>
Chrysler	1	2009	US	Car	323	319	287,364	224,447
				Truck	439	402	528,286	4,414,889
		2010	US	Car	301	316	430,110	(1,259,775)
				Truck	420	394	729,662	4,284,933
		2011	US	Car	267	309	335,790	(2,753,843)
				Truck	390	396	739,487	(1,002,145)
<b>Chrysler Total</b>							<b>3,050,699</b>	<b>3,908,506</b>
Ford	1	2009	US	Car	323	299	508,727	2,384,066
				Truck	439	397	504,921	4,789,847
		2010	US	Car	301	289	856,065	2,005,904
				Truck	420	406	965,968	3,054,497
		2011	US	Car	267	283	792,654	(2,476,429)
				Truck	390	387	873,635	591,971
<b>Ford Total</b>							<b>4,501,970</b>	<b>10,349,856</b>
GM	1	2009	US	Car	323	295	1,048,593	5,733,069
				Truck	439	413	844,892	4,961,620
		2010	US	Car	301	298	857,825	502,507
				Truck	420	382	932,358	8,002,308
		2011	US	Car	267	296	1,006,900	(5,701,728)
				Truck	390	382	1,419,043	2,564,097
<b>GM Total</b>							<b>6,109,611</b>	<b>16,061,873</b>
Honda	3	2009	NC	Car	323	257	433,183	5,582,613
				Truck	381	339	232,149	2,202,242
			CA	Car	323	266	388,318	4,321,998
				Truck	439	373	89,079	1,327,909
		2010	NC	Car	323	251	414,562	5,828,330
				Truck	376	329	290,216	3,080,833
			CA	Car	301	262	429,692	3,272,232
				Truck	420	366	95,106	1,159,980

Manufacturer	Pathway	Model Year	Region	Fleet	Fleet Threshold (g/mi)	Fleet Average (g/mi)	Vehicle Production (# units)	Fleet Average Credits (Mg)
		2011	NC	Car	290	253	317,065	2,290,721
				Truck	347	338	280,042	569,265
		CA	Car	267	250	247,437	821,364	
			Truck	390	335	244,121	3,032,611	
<b>Honda Total</b>							<b>3,460,970</b>	<b>33,490,098</b>
Mazda	3	2009	NC	Car	323	280	61,283	514,554
				Truck	381	329	35,084	412,061
			CA	Car	323	281	40,884	335,293
				Truck	439	379	10,612	143,813
		2010	NC	Car	323	263	133,292	1,561,628
				Truck	376	329	64,558	685,325
			CA	Car	301	265	86,948	611,201
				Truck	420	360	25,351	343,554
		2011	NC	Car	289	266	112,883	506,966
				Truck	347	359	18,435	(49,966)
			CA	Car	267	256	59,856	128,565
				Truck	390	339	25,145	289,648
<b>Mazda Total</b>							<b>674,331</b>	<b>5,482,642</b>
Mitsubishi	3	2009	NC	Car	323	294	60,347	341,724
				Truck	381	322	8,573	114,244
			CA	Car	323	290	23,293	150,093
				Truck	439	342	872	19,105
		2010	NC	Car	323	277	30,144	270,758
				Truck	376	323	14,832	177,552
			CA	Car	301	288	15,733	39,937
				Truck	420	365	2,699	33,529
		2011	NC	Car	288	266	49,447	212,415
				Truck	335	325	15,159	34,239
			CA	Car	267	267	25,408	0
				Truck	390	358	7,712	55,740
<b>Mitsubishi Total</b>							<b>254,219</b>	<b>1,449,336</b>
Nissan	1	2009	US	Car	323	268	605,439	6,502,124
				Truck	439	372	234,883	3,554,474
		2010	US	Car	301	266	617,548	4,220,471
				Truck	420	399	236,588	1,122,176
		2011	US	Car	267	261	666,660	781,048
				Truck	390	382	299,074	540,403



Manufacturer	Pathway	Model Year	Region	Fleet	Fleet Threshold (g/mi)	Fleet Average (g/mi)	Vehicle Production (# units)	Fleet Average Credits (Mg)
<b>Nissan Total</b>							<b>2,660,192</b>	<b>16,720,696</b>
<b>Subaru</b>	<b>1</b>	2009	US	Car	<b>323</b>	308	156,871	459,469
				Truck	<b>439</b>	322	43,945	1,161,300
		2010	US	Car	<b>301</b>	299	183,763	71,765
				Truck	<b>420</b>	292	74,489	2,153,531
		2011	US	Car	<b>267</b>	295	176,923	(967,307)
				Truck	<b>390</b>	292	129,950	2,876,413
<b>Subaru Total</b>							<b>765,941</b>	<b>5,755,171</b>
<b>Suzuki</b>	<b>1</b>	2009	US	Car	<b>323</b>	275	24,859	232,995
				Truck	<b>439</b>	345	10,146	215,413
		2010	US	Car	<b>301</b>	259	20,212	165,760
				Truck	<b>420</b>	337	8,728	163,622
		2011	US	Car	<b>267</b>	262	19,390	18,931
				Truck	<b>390</b>	345	7,864	79,929
<b>Suzuki Total</b>							<b>91,199</b>	<b>876,650</b>
<b>Tesla</b>	<b>1</b>	2010	US	Car	<b>301</b>	0	599	35,206
		2011	US	Car	<b>267</b>	0	269	14,024
<b>Tesla Total</b>							<b>868</b>	<b>49,230</b>
<b>Toyota</b>	<b>1</b>	2009	US	Car	<b>323</b>	245	1,273,815	19,400,957
				Truck	<b>439</b>	345	482,202	10,237,780
		2010	US	Car	<b>301</b>	228	1,412,172	20,129,484
				Truck	<b>420</b>	353	793,226	12,003,853
		2011	US	Car	<b>267</b>	243	1,140,255	5,343,618
				Truck	<b>390</b>	321	834,019	12,997,923
<b>Toyota Total</b>							<b>5,935,689</b>	<b>80,113,615</b>
<b>Volkswagen</b>	<b>3</b>	2009	NC	Car	<b>323</b>	290	139,498	898,885
				Truck	<b>381</b>	363	21,078	85,694
			CA	Car	<b>323</b>	293	118,411	693,642
				Truck	<b>439</b>	382	13,295	171,164
		2010	NC	Car	<b>323</b>	274	143,295	1,371,037
				Truck	<b>376</b>	356	23,488	106,102
			CA	Car	<b>301</b>	277	134,231	629,052
				Truck	<b>420</b>	361	19,350	257,859
		2011	NC	Car	<b>289</b>	267	151,373	650,269
				Truck	<b>342</b>	332	35,176	79,450
			CA	Car	<b>267</b>	273	121,114	(141,895)
				Truck	<b>390</b>	334	25,667	324,648

Manufacturer	Pathway	Model Year	Region	Fleet	Fleet Threshold (g/mi)	Fleet Average (g/mi)	Vehicle Production (# units)	Fleet Average Credits (Mg)
<b>Volkswagen Total</b>							<b>945,976</b>	<b>5,125,907</b>
<b>Volvo</b>	<b>1</b>	2009	US	Car	<b>323</b>	317	31,618	37,043
				Truck	<b>439</b>	407	11,420	82,540
		2010	US	Car	<b>301</b>	317	23,529	(73,510)
				Truck	<b>420</b>	380	34,413	310,908
		2011	US	Car	<b>267</b>	300	24,846	(160,100)
				Truck	<b>390</b>	354	27,761	225,729
<b>Volvo Total</b>							<b>153,587</b>	<b>422,610</b>

**APPENDIX II – SUMMARY OF REPORTED CREDITS BY TYPE AND MODEL YEAR, BY MANUFACTURER**

<b>Manufacturer</b>	<b>MY</b>	<b>Fleet</b>	<b>A/C Efficiency</b>	<b>A/C Leakage</b>	<b>Off-Cycle</b>	<b>Fleet Average</b>	<b>Grand Total</b>
<b>BMW</b>	<b>2009</b>	Car	62,528	47,490		316,248	426,266
		Truck	16,106	17,334		-49,852	-16,412
	<b>2010</b>	Car	46,231	34,939		197,441	278,611
		Truck	12,765	13,670		-24,596	1,839
	<b>2011</b>	Car	113,483	80,174		-30,064	163,593
		Truck	30,428	35,952		-35,374	31,006
	<b>Total</b>		<b>281,541</b>	<b>229,559</b>		<b>373,803</b>	<b>884,903</b>
<b>Chrysler</b>	<b>2009</b>	Car	68,074	237,143		224,447	529,664
		Truck	86,828	551,632		4,414,889	5,053,349
	<b>2010</b>	Car	107,553	352,786		-1,259,775	-799,436
		Truck	111,650	740,466		4,284,933	5,137,049
	<b>2011</b>	Car	118,345	340,299		-2,753,843	-2,295,199
		Truck	324,184	843,506		-1,002,145	165,545
	<b>Total</b>		<b>816,634</b>	<b>3,065,832</b>		<b>3,908,506</b>	<b>7,790,972</b>
<b>Daimler</b>	<b>2009</b>	Car	30,018	31,408			61,426
		Truck	16,744	18,297			35,041
	<b>2010</b>	Car	35,122	30,856			65,978
		Truck	25,808	32,334			58,142
	<b>2011</b>	Car	71,586	41,110			112,696
		Truck	28,138	16,851			44,989
	<b>Total</b>		<b>207,416</b>	<b>170,856</b>			<b>378,272</b>
<b>Ford</b>	<b>2009</b>	Car		247,818		2,384,066	2,631,884
		Truck		830,382		4,789,847	5,620,229
	<b>2010</b>	Car	15,304	387,819		2,005,904	2,409,027
		Truck	6,501	1,623,677		3,054,497	4,684,675
	<b>2011</b>	Car	14,415	476,473		-2,476,429	-1,985,541
		Truck	64,493	1,279,698		591,971	1,936,162
	<b>Total</b>		<b>100,713</b>	<b>4,845,867</b>		<b>10,349,856</b>	<b>15,296,436</b>
<b>GM</b>	<b>2009</b>	Car	113,142	792,488		5,733,069	6,638,699
		Truck	12,683	1,393,043	3,329	4,961,620	6,370,675
	<b>2010</b>	Car	99,629	716,959		502,507	1,319,095
		Truck	263,524	1,487,242	965	8,002,308	9,754,039
	<b>2011</b>	Car	310,606	1,340,422		-5,701,728	-4,050,700
		Truck	330,160	1,648,173	1,338	2,564,097	4,543,768
	<b>Total</b>		<b>1,129,744</b>	<b>7,378,327</b>	<b>5,632</b>	<b>16,061,873</b>	<b>24,575,576</b>
<b>Honda</b>	<b>2009</b>	Car	161,988	246,771		9,904,611	10,313,370
		Truck	53,885	176,484		3,530,151	3,760,520
	<b>2010</b>	Car	177,222	277,048		9,100,562	9,554,832
		Truck	48,334	226,311		4,240,813	4,515,458
	<b>2011</b>	Car	119,152	142,831		3,112,085	3,374,068
		Truck	111,311	283,673		3,601,876	3,996,860
	<b>Total</b>		<b>671,892</b>	<b>1,353,118</b>		<b>33,490,098</b>	<b>35,515,108</b>
<b>Mazda</b>	<b>2009</b>	Car				849,847	849,847
		Truck				555,874	555,874
	<b>2010</b>	Car				2,172,829	2,172,829
		Truck				1,028,879	1,028,879

Manufacturer	MY	Fleet	A/C Efficiency	A/C Leakage	Off-Cycle	Fleet Average	Grand Total
	2011	Car				635,531	635,531
		Truck				239,682	239,682
	<b>Total</b>					<b>5,482,642</b>	<b>5,482,642</b>
Mitsubishi	2009	Car				491,817	491,817
		Truck				133,349	133,349
	2010	Car				310,695	310,695
		Truck				211,081	211,081
	2011	Car				212,415	212,415
		Truck				89,979	89,979
<b>Total</b>					<b>1,449,336</b>	<b>1,449,336</b>	
Nissan	2009	Car	225,310	20,466		6,502,124	6,747,900
		Truck	94,333	100,005		3,554,474	3,748,812
	2010	Car	231,360	16,755		4,220,471	4,468,586
		Truck	81,072	109,905		1,122,176	1,313,153
	2011	Car	248,584	44,656		781,048	1,074,288
		Truck	102,799	135,259		540,403	778,461
<b>Total</b>		<b>983,458</b>	<b>427,046</b>		<b>16,720,696</b>	<b>18,131,200</b>	
Subaru	2009	Car				459,469	459,469
		Truck				1,161,300	1,161,300
	2010	Car				71,765	71,765
		Truck				2,153,531	2,153,531
	2011	Car				-967,307	-967,307
		Truck				2,876,413	2,876,413
<b>Total</b>					<b>5,755,171</b>	<b>5,755,171</b>	
Suzuki	2009	Car				232,995	232,995
		Truck				215,413	215,413
	2010	Car				165,760	165,760
		Truck				163,622	163,622
	2011	Car				18,931	18,931
		Truck				79,929	79,929
<b>Total</b>					<b>876,650</b>	<b>876,650</b>	
Tesla	2010	Car	374			35,206	35,580
		Truck					
	2011	Car	168			14,024	14,192
<b>Total</b>		<b>542</b>			<b>49,230</b>	<b>49,772</b>	
Toyota	2009	Car	639,927	507,913		19,400,957	20,548,797
		Truck	195,200	343,961		10,237,780	10,776,941
	2010	Car	768,652	583,900		20,129,484	21,482,036
		Truck	373,144	598,764		12,003,853	12,975,761
	2011	Car	621,412	532,137		5,343,618	6,497,167
		Truck	483,423	343,787		12,997,923	13,825,133
<b>Total</b>		<b>3,081,758</b>	<b>2,910,462</b>		<b>80,113,615</b>	<b>86,105,835</b>	
Volkswagen	2009	Car	231,296	110,126		1,592,527	1,933,949
		Truck	28,408	23,990		256,858	309,256
	2010	Car	249,431	120,055		2,000,089	2,369,575
		Truck	42,110	36,017		363,961	442,088
	2011	Car	239,277	109,887		508,374	857,538
		Truck	71,965	52,936		404,098	528,999
<b>Total</b>		<b>862,487</b>	<b>453,011</b>		<b>5,125,907</b>	<b>6,441,405</b>	
Volvo	2009	Car				37,043	37,043
		Truck				82,540	82,540

<b>Manufacturer</b>	<b>MY</b>	<b>Fleet</b>	<b>A/C Efficiency</b>	<b>A/C Leakage</b>	<b>Off-Cycle</b>	<b>Fleet Average</b>	<b>Grand Total</b>
	<b>2010</b>	Car				-73,510	-73,510
		Truck				310,908	310,908
	<b>2011</b>	Car				-160,100	-160,100
	<b>Total</b>					<b>196,881</b>	<b>196,881</b>